

used to convey camera data from camera 102 to storage and processing circuitry in device 10. The upper surface of thin-film transistor layer 76 contains an array of thin-film transistors and associated conductive traces. As shown in the cross-sectional view of FIG. 8, the lower surface of thin-film transistor layer 76 may be provided with traces 104. Flex circuit cable 106 may have contact pads that are electrically connected to camera 102 at end 108 and contact pads that are electrically connected to traces 104 at end 110. Using this type of arrangement, camera data can be conveyed using traces 104. This may help reduce or eliminate the need for additional cables in device 10.

[0061] Camera 102 is merely an example of an electrical component for which signals may be routed through underside traces on thin-film transistor substrate 76. In general, any electrical component that produces or receives electrical signals in device 10 can be electrically connected to traces 104. The use of traces 104 on layer 76 can reduce the number of cables used to route signals between these electrical components and processing circuitry in device 10 (i.e., circuits on a main logic board and other storage and processing circuitry in device 10).

[0062] As shown by dashed line 112, an antenna may be formed from some of the traces 104 on layer 76. Antenna 112 may be, for example, an antenna for a local wireless network or a cellular telephone.

[0063] Traces 104 may be formed from any suitable conductor. In typical configurations for display module 82, backlighting is provided by structures 80. It is therefore typically desirable to form traces 104 from transparent conductive materials such as indium-tin oxide. This is, however, merely one illustrative material that may be used for traces 104. In general, any suitable conductor may be used. Moreover, it is not necessary to form traces 104 on the underside of thin-film transistor substrate layer 76. Traces 104 may be formed on other glass layers in module 82. For example, signal paths for camera signals, antenna signals, or other electrical component signals can be formed from indium-tin oxide patterns on the surface of a cover glass layer, a color filter layer (e.g., layer 70), a glass layer in structures 80, or other suitable display module layers.

[0064] As shown in the cross-sectional view of FIG. 9, ink border 88 may be provided with opening 87 and polarizer 68 may be provided with opening 681. This allows light to pass to and from the lower layers of display module 82, without forming holes in thin-film transistor substrate layer 76 and color filter glass layer 70. Even though no hole is formed in layers 70 and 76 (in the FIG. 9 example), light for electronic component 102 may still pass through openings 87 and 681 and may pass through the clear portions of layers 70 and 76 under openings 87 and 681. Electronic component 102 may be a camera, sensor, or other suitable electronic component. Component 102 may receive light along path 89. Component 102 may be mounted to the underside of thin-film transistor layer or, as indicated by dashed line 1020, may be mounted to the underside of color filter glass layer 70.

[0065] The perspective view of FIG. 10 shows how an electrical component 102 (e.g., a camera, sensor, antenna, button, or any other suitable component) may be mounted to the upper surface of thin-film transistor substrate layer 76 outside of the active area of display module 82. The active area of display module 82 may be aligned with color filter 70 or may have an area that is somewhat smaller than the surface area of color filter 70 (i.e., in alignment with the

thin-film transistor array on thin-film transistor substrate 76). As shown in FIG. 10, conductive traces 94 may also be formed outside of the active area to route signals to and from electrical component 102.

[0066] In the illustrative arrangement of FIG. 11, electrical component 102 has been mounted to an upper surface of color filter glass layer 70. Conductive traces 94 that lie outside of the active area of display module 82 may be used to convey signals to and from electrical component 102. Conductive traces 94 may be formed on the upper surface of color filter glass layer 70 (e.g., under a polymer coating layer or other protective layer) or may be formed on the lower surface of color filter glass layer 70 or the upper surface layer of thin-film transistor substrate layer 76. Vias 95 may be formed through color filter glass layer 70 to interconnect component 102 and conductive traces that have been formed lower in the display module stack. Vias may also be formed through other glass layers such as thin-film transistor substrate layer 76 (e.g., to use traces on the lower surface of the thin-film transistor substrate layer to route signals in module 82).

[0067] FIG. 12 is a cross-sectional side view of a portion of a display module showing how layers of glass such as cover glass layer 360, color filter glass 70, and thin-film transistor substrate layer 76 may each have peripheral edge portions 117 that rest on housing wall ledge portion 116 of housing 26. Module 82 may be provided with a chassis such as metal chassis member 420. A laterally extending edge portion of member 420 may also rest on ledge 116 below cover glass 360, color filter 70, and thin-film transistor substrate 76. Adhesive 114 may be used to secure these layers to housing 26.

[0068] FIG. 13 shows an arrangement of the type shown in FIG. 12 in which elastomeric trim 66 (sometimes referred to as a gasket) has extending portion 660. Extending portion 660 covers portion 26AA of housing 26 and all of the exposed upper surfaces of housing 26 (i.e., all of surfaces 263, 265, and 267, including the portions of surface 263 that are adjacent to peripheral outer edge 269 of housing 26). Because all upper surface portions of housing 26 are covered (either with cover glass or trim), the arrangement of FIG. 13 helps improve the cosmetic appearance of device 10 when viewed from direction 661.

[0069] The foregoing is merely illustrative of the principles of this invention and various modifications can be made by those skilled in the art without departing from the scope and spirit of the invention.

What is claimed is:

1. An electronic device comprising:
 - a display comprising:
 - a display layer having an opening, wherein the display layer has a first portion and a second portion and wherein the opening is interposed between the first portion and the second portion;
 - a cover layer that overlaps the display layer; and
 - a light-sensing component overlapped by the cover layer, wherein the light-sensing component receives light through the cover layer and is aligned with the opening in the display layer.
2. The electronic device defined in claim 1 further comprising:
 - a housing having a rear portion and housing walls that extend from the rear portion, wherein the display is mounted in the housing, wherein the housing walls